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ABSTRACT

The dependency approach to grammar, in which it is assumed that grammatical relations can be described in terms of a relation between two element types, a head and a dependent, is discussed in the context of Arabic. Operational criteria used for defining the notions of head and dependency are reviewed, and claims for the usefulness of recognizing head and dependent elements are evaluated. It is concluded that none of the syntactic criteria achieves the desired results and that in general a grammar can be constructed without recognizing head and dependent as primitive constructs. It is also argued that while the notion of dependency is useful, it should be understood simply as a bilateral relation between grammar items. (MSE)

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ON GETTING A HEAD: A PROBLEM IN DEPENDENCY GRAMMAR

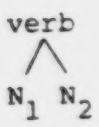
Jonathan Owens

One of the problems within the dependency tradition has been finding criteria to distinguish various categories. Thus Vater (1978:39) concludes that it is impossible to find operational criteria for distinguishing actants from adjuncts (circonstances). One can ask a similar question of the notions 'head' and 'dependent'. In part 1 I will survey a number of operational criteria that have been proposed for defining these notions and also will examine some claims that have been made for the usefulness of recognizing head and dependent.

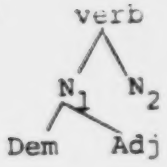
I will argue that none of the syntactic criteria achieve the desired results, and that in general a grammar can get along without recognizing 'head' and 'dependent' as primitive constructs. On the other hand, I argue (part 2) that the notion of dependency is a useful one, but that dependency should be understood simply as a bilateral relation between items.[1]

1. Dependency

Dependency grammar as described by Tesnière (1959), Hays (1964), and others assumes that grammatical relations can be described in terms of a relation between two types of elements, a head and a dependent. For Tesnière, typical dependency relations are as follows:

(1a) 

(1b)

(1c) 

A verb is the head of a sentence, governing up to three actants (object and subject), while a noun is the head to an adjective and demonstrative. (1c) would represent a sentence like,

(1d) $\underset{\text{dem.}}{\underline{\text{that}}}$ $\underset{\text{adj.}}{\underline{\text{big}}}$ $\underset{N_1}{\underline{\text{man}}}$ $\underset{V}{\underline{\text{saw}}}$ $\underset{N_2}{\underline{\text{them}}}$

For Tesniere, head and dependent are givens. Implicitly for him these categories are defined lexically. Given his division of words into four classes--nouns, verbs, adjectives, and adverbs--in a relation between any two of these one is typically head, the other dependent. A verb governs a noun, a noun an adjective, and an adjective an adverb. However efficacious these assumptions are for his overall grammar--one justification he does give for this analysis (p. 105)--he presents no syntactic criteria to justify this categorization. In the rest of this section I will discuss various criteria by which a head and dependent have been identified.

1.1 Dependency based on form

The medieval Arabic grammarians developed a dependency grammar based to a large extent on morphological form. For them a single dependent (ma^{c}muul, 'operated on, governed') is governed by a single head (^{c}aamil 'operator, governor') and the dependency relation is typically shown morphologically by varying case (for nouns) or mode (for verbs) suffixes on the dependent item. This relation is summarized by the Arabic grammarian Al-Anbaarii (d. 1181) 'Governable items are those whose forms change according to the governor' ("?al-mu^{c}rabu huwa maa tagayyara ?aaxiruhu be-tagyiiri al-^{c}aamil") (p.12).

(2a) lan tadhab-a 'you will not go'

(2b) ra?a al-rajul-u al-mar?at-a 'the man saw the woman'

The case/mode suffixes are underlined. In (2a) the negative future marker lan governs the verb in the -a form (subjunctive), while in (2b) the verb governs the subject in the -u (nominative) form and the object in the -a (objective) form.

There are two drawbacks in basing the model on morphological facts. First, it does not give a unified description of sentence structure. This is apparent in example (2), which can be diagrammed as follows, applying Tesnière stemma to represent the dependency relations, with head (governor) on top of dependents.

(3a) lan
|
tadhaba

(3b) ra?a
al-rajulu al-mar?at-a

In some cases the topmost item (head= in the sentence is a morpheme such as lan, while in others (more usually) it is a verb, as in (3b). This conclusion seems inevitable if one gives preeminent emphasis to morphological form in deciding what the dependency relations are.

Secondly, it is of limited value for universal grammar. In a language like East African Nubi (Owens 1977) which does not distinguish case or mode in any items (including pronouns) morphologically there would be no basis for deciding between head and dependent on the basis of form alone, which is what the present approach requires.

1.2 Head as obligatory or presupposed element

One of the most common criteria given is that head is an obligatory element in a construction. This argument is developed in slightly different form by Hjelmslev (1939) and Hudson (1982, 3/8), Robinson (1970) and Hudson (1980b).

Hjelmslev proposed that syntactic relations are bilateral and that they can be classified according to three types of relations, one of which corresponds to some extent with a dependency relation, relating head and dependent.

Determination: x determines y if x presupposes y without the reverse holding.

This is similar to one criterion Hudson (1982,3/8) gives for identifying the head: the presence of a dependent presupposes a head.

(4) the (big) men came. The big came.*

In this example the determined item (the noun) corresponds to the head in Tesniere's grammar, the determining to the dependent. The adjective determines the noun, and so depends on it (in Hudson's formulation, the presence of the adjective presupposes a head noun, though the reverse does not hold).

Robinson identifies the head item as the one which always characterizes a construction "...the category of the distinctive constituant is the sine qua non whose obligatory occurence characterizes the construction" (271). She notes that the characterizing item (the head) need not be the only obligatory element in a construction, but it will always occur.

For Hudson (1980b) the dependent item is optional in the presence of the head. He gives two examples--adjectives are always optional in the presence of a noun (e.g. (4) above), while the object is optional in the presence of a verb (considering the total class of verbs). Verb and noun would then be head items.

In all the characterizations the head will be obligatory. It is in the noun phrase, however, that this characterization of 'head' is the least warranted. The following table presents data from 9 languages and 6 language families. A '+' indicates that the category can occur without the other items on the list. Thus, one has for example,

(5)	English	Harar Oromo	
only N	men came	namnii ni-d'ufe	'the man came'
only Dem	those came	sun ni-d'ufan	'those came'
only Num	three came	seden ni-d'ufan	'three came'

(6)[2]

	Arabic	Nubi	Oromo	French	English	Swahili	Tamil	Quechua	Mangarayi
Noun	+	+	+		+	+	+	+	+
Dem	+	+	+		+	+	(+)	+	+
Num	+	+	+	+	+	+	+	+	+
Adj	(+)	(+)				?		+	?

The implications for the criteria given above are as follows. For Hjemslev, neither numeral (for example) nor noun could be said to determine the other, since neither presupposes the other. Thus, his definition of determination cannot identify head and dependent in this case. Similarly, for Hudson (1982), where numeral and demonstrative would be head to a noun (cf. eg. (8) below) neither noun nor demonstrative/ numeral could be said to be head to the other, since neither are presupposed by the presence of the other. The same applies to the relation between the demonstrative and numeral.

For Robinson, for whom the noun is the head of a noun phrase, the noun cannot be said to be head since it is not an obligatory item. Given a transformational apparatus such as Robinson assumes for her dependency grammar, one might introduce both noun and numeral/demonstrative obligatorily in the base, then delete the noun in a later transformational rule to get examples like (5). However, this seems a rather arbitrary means to save the criterion, which seems to me to rest on an independent definition of 'characterizing category', a notion based on the idea of obligatory occurrence in all constructions.

Finally, Hudson's (1980) criterion based on optionality does not work, since it would be arbitrary to choose either numeral or noun as head since both are optional in the presence of the other (in Hudson, 1980, noun should be head).

Thus, the status of an item as head or dependent is largely irrelevant to considerations of optionality or determination (in Hjelmslev's sense) for an important set of noun phrase elements.

1.3 The usefulness of having head and dependent

Hudson has suggested three more reasons why it is desirable to distinguish head and dependent. These are perhaps not so much criteria for identifying heads and dependents as attempts to show their utilitarian value. Two of these (1.3.2/3 below) I think are valid, though one must use caution in determining just what the value is. Even accepting their usefulness, however, does not commit one to recognizing 'head' and 'dependent' as primitive concepts.

1.3.1 Semantics

Hudson (1982 3/8, 3/28 ff) claims that it is easier to formulate a rule relating the semantic features of an adjective to the noun it describes when the noun, rather than the adjective, is head. This is a general-claim of the same order as Tesnière's (cf. 1) whereby the overall grammar is simpler if dependency relations are formulated in this way. However, since he makes no attempt to write a grammar with adjective as head, the claim is not well substantiated.

In the adjective-noun relation (modifier-head) the adjective adds semantic information to the noun by filling a properties slot for the noun (3/29). However, Hudson has himself pointed out examples where as adjective's meaning must refer to the noun it modifies (1980b:502, 1982 2/45).

(7a) dry wine (dry$_1$ 'opposite of sweet')
dry paint (dry$_2$ 'opposite of wet')

Dry$_1$ is selected by wine and dry$_2$ by paint. However, the only basis by which the two meanings are distinguished is by reference to the nouns they modify--that is, the different meanings must be distinguished by reference to a 'substance' slot in the entry for the adjective.

It would seem then that adjectives have to be able to refer to their heads for their complete semantic structure. Since adjective and noun both require semantic slots for the other, there is a relation of mutual dependence between them, a situation compatible with the characterization of dependency I give below (2.1).

1.3.2 Cross-categorical generalizations

Hudson's arguments pertaining to cross-categorical generalization are tied in part to his analysis of the noun phrase starting from left to right, with the left hand member being head to a following right hand one (except for the adjective, which depends on the noun, Hudson 1981.11 ff.)

(8) both those two big men

He notes that by considering the determiner the head item his analysis allows English to be more consistently a head-modifier language, since in the noun phrase the head will precede its modifier and in the clause the verb precedes its modifiers (except the subject).

While Hudson's arguments are in general terms valid (as pointed out first by Tesnière) there is a danger in trying to explain too much in terms of head and dependent. In the present case one can detect a degree of circularity in Hudson's argument: heads precede dependents in English, so determiners can be considered heads, and this reinforces the efficacy of assuming that heads precede dependents.

However, this first of all assumes that languages tend to be typologically pure. However, the data presented in word order research (e.g. Hawkins 1980) shows languages as ranging from pure head-modifier to pure modifier-head types, with various mixtures in between (e.g. SOV and noun-modifier, as in Oromo).

Even accepting that languages tend toward purity here, for comparative purposes one has to adopt Hudson's 'determiner as head' approach throughout. But while this analysis makes English more typologically consistent, it does the reverse for

other languages like Swahili. Using verb and noun as head, Swahili generally is a head-modifier language, with the exception that the subject precedes the verb.

(9) SVO mtu alivunja meza 'the man broke a table'
N-Adj mtu mkubwa 'a big man'
N-Dem mtu yule 'that man'
N-Num mtu mmoja 'one man'
N-Genitive meza yako 'your table'

Considering the determiner (demonstrative, numeral) as head, however, results in a less pure typology--V-O, head-modifier, but N-Det, modifier-head.

In short, one must exercise caution in using an appeal to cross-generalization to justify particular dependency analysis in particular languages.

1.3.3 Position

Finally Hudson says that dependents are positioned relative to the head, rather than vice versa. Again, while this may be true in the majority of cases, there are exceptions (as Hudson himself points out, 1982:2/43). An interesting point about sequence is that certain sequences occur with near universal regularity. Thus Greenberg (1966:68) notes that if demonstrative, numeral and adjective all occur before the noun, they must occur in that order. Similarly, in a number of languages, perhaps most, the word meaning 'all' tends to occur at the extremes of the noun phrase, either at the very beginning or at the very end.[3]

The regularity of these sequence patterns suggests an ordering based on semantic and pragmatic conditions quite independent of the status of an item as head or dependent.

So far, no convincing criteria have been found for distinguishing head and dependent. Before offering a different syntactic characterization of dependency one more criterion for identifying heads can be suggested.

1.4 Head as referentially central

A semantic basis for the distinction between head and dependent can be given as follows:

(10) The head is the item referentially central in a construction.

To take the noun first, the noun is referentially central in that all modifiers of a noun must be connected to a noun, either overtly or elliptically (pragmatically) understood. However, noun modifiers are not understood in similar fashion. If one says,

(11a) those/mine/all/a few came

the sentence is semantically odd unless one knows what head noun is being referred to. However, in,

(11b) those men came

or (11c) good men came

one does not have to supply an adjective modifier in (11b) or a demonstrative in (11c) in order to make sense of the sentence.

With the verb, the main verb will be considered the head to an auxiliary modifier (though cf. 2.23 for discussion).

(12a) he may (ill-formed unless a main verb is understood).

(12b) he came (no auxiliary need be interpreted)[4].

Finally, between an adjective and adverbial modifier the adjective will be considered the head.

(13a) Was he big? Very. (i.e. big)

(13b) He was big. (no adverbial modifier need be inferred)

Note that this method of identifying the head corresponds to Tesnière's selection of heads and dependents (section 1), and it also fits fairly well with the method I outline in the next section (except for the verb auxiliary).

2. Bilateral Dependency

2.1 To this point I have argued that no clear syntactic criteria for recognizing a head have been found. Nor do I think that Hudson's most recent position (1982) will solve this problem. He says that although there is no single criterion or criteria which always work to distinguish head and dependent,

when considered together criteria like the above (except 1.4) will result in choosing one item as head.

In fact, it was seen that none of the criteria put forward work very well in distinguishing head and dependent, so it is hardly reasonable to claim that a set of faulty criteria should work any better. In any case, if one can find one basic criterion for distinguishing head and dependent, then I think it would be preferred to a disparate set of criteria, and in this section I will suggest that such a criterion can be found.

If my operational objections to the notions of 'head' and 'dependent' are valid, then it might be relevant to look for another characterization of dependency. Moreover, something has to be found, for otherwise one would be in no position to explain why sets of words do form recognizable groups, like 'noun phrases' and 'sentences'. This indeed is perhaps the basis for recognizing dependency relations, to explain connectedness, why items group together.

I would suggest that 'dependency' be understood as follows:

(14) Items in a dependency relation are bilaterally related to each other.[5]

This makes no mention of head and dependent, and so avoids the question of how to identify one or the other.

In standard dependency grammar (Robinson 1970:260), (Hudson 1982:3/11) one explains the clustering of items by saying that dependents tend to cluster around their heads. Thus, if an adjective is dependent on a noun which is in subject position, then the adjective will also occur in the subject position, not somewhere else. In my revised characterization of dependency the clustering of items will be explained by saying that items in a dependency relation cluster together. Thus if an adjective and noun are related to each other, they will occur together, and follow each other around whether in subject position, or wherever.

Of course, at this point I do not define head and dependent so I cannot explain NP and clause order any more specifically than this. I will return to this point later in this section.

This formulation avoids one embarrassing problem for head-dependency analysis in regard to determination of morphological form. In a language with morphological case it would generally be said that a verb determines the case forms of its actants. Thus, in Classical Arabic the verb governs its subject in the nominative and its object in the accusative (cf. 1.2)

(15) ra?a zaydun al-rajula 'Zayd saw the man'
nom. acc. (the man)

On the other hand, where a verb agrees with its subject in some category it will be the subject noun that determines the form of the verb. This can also be illustrated in Classical Arabic.

(16) zaydun ḏahaba 'Zayd went'
hindun ḏahabat 'Hind went'
al-rijjaal-u ḏahabuu 'the men went'
pl.

A grammar which recognizes the verb as head to a dependent subject, the standard dependency analysis, is hard put to explain why the features of the dependent item determine the form or the head while at the same time being governed (in a particular case) by the verb (as in Hudson 1982:3/35)[6].

Hudson (1982:3/37) explains subject-verb agreement by noting that agreement always proceeds from the fixed category--number, gender are fixed in the noun and so determine the form of the verb. Still it is the case that the 'head' is the item whose form is determined. In the formulation of (14) no anomaly is involved; one can expect items in a dependency relation to have this relation expressed formally in certain ways, by overt case marking and agreement for example, and one can allow the direction of agreement to be determined by other principles, such as the one Hudson proposes. For dependency relations, all that agreement or case marking shows is that a relation exists between the items concerned.[7].

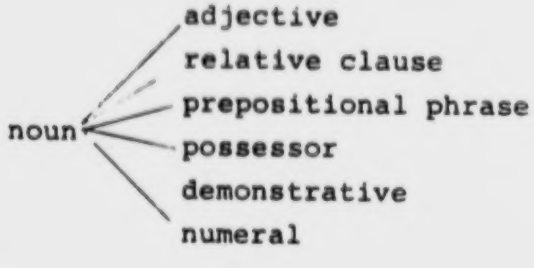
In my formulation (14) there is still a problem in explaining sequence. While some word order tendencies are not explicable in terms of head and dependent (cf. 1/3.3), a great many are. Thus, word order studies virtually always refer to the categories of head and dependent or something equivalent (Tesnière 1959, Greenberg 1966, Hawkins 1980). Without a characterization of 'head', however, these important generalizations would be lost to dependency grammar.

I think the notion of head can be defined as a derivative concept as follows.

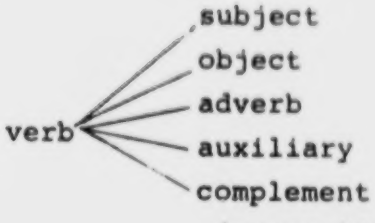
(17) Given a set of bilateral dependency relations the head is the item which contracts relations with all the other items, i.e. the head is the item with the most general distribution.

One would have the following relations, where the connecting line simply represents a bilateral dependency relation, a relation connecting items grammatically and semantically without reference to their status as head and dependent.

(18a)



(18b)



(prove him wrong)

Verb and noun are heads, since they have relations with all other items.

I can note that this definition of 'head' accords quite well with the semantic definition given in (1.4) (as well as with Tesnière's). It also agrees with Hawkin's assumptions that for word order purposes, verb and noun are heads (operands, cf. following discussion). This convergence can be taken as independent confirmation of the efficacy of this characterization.

2.2 There are four qualifications to be made here.

2.2.1 First, this definition does not have a characterization of head in the case of pre- and post-positions and their object, since there is only one object and one adoption. However, there is a close relationship between the noun possessor and adposition object, with object equivalent to possessor.[8] Hawkins (1980:214) notes a high position correlation between postposition, possesser noun order (head first) and preposition, noun possessor order (head first) and conversely a slightly smaller correlation between pssr-noun and post-position and noun pssr, preposition, Adposition + object may thus be able to be considered a special type of noun-possessor relation.

2.2.2 A similar case involves degree adverbs, very long. Since there are only two items in the relation, there is noreason to consider either as head. For this I would propose the following. Between X and Y, if X forms a syntactic relation with Z, and Y has no syntactic relation other than with X, then X is head to Y. In

(19) a very big man came
Y X Z

the adjective big is related to both very and man, very only to big, so big will be head to very, as one would expect from word order tendencies (Hawkins 1982:4).

2.2.3 I think one place where both (18b) and the semantic criterion of 1.4 (e.g. 12) are wrong is the auxiliary. These have auxiliary as dependent on the main verb, but Hudson has argued that the auxiliary is head to the main verb, and for word order purposes this may be the 'correct' analysis (at least in Oromo, Swahili, English, French, Nubi, Arabic, and Tamil, as well as Greenberg 1966:67; see also n. 9).

This discrepancy might be explained by noting that where auxiliaries have essentially the same morphological characteristics as a main verb (e.g. inflect for person, gender, number, tense, mood, etc.) the auxiliary is a verb which also has a copular or main verb function. The verbal complement to an auxiliary thus essentially fills the position of a nominal, adjectival or locative complement to the auxiliary.

ENGLISH

(20) he is a man
he is going

SWAHILI

(21) alikuwa mzuri 'he was good'
alikuwa akitembea 'he was walking'
he walk

ARABIC

(22) huwa kaana jayyidan 'he was good'
huwa kaana yadhabu 'he was going'

NUBI

(23) uwo gu-ruwa ina 'he is going there'
uwo gu-ruwa akulu 'he is going to eat'

OROMO (HARAR)

(24) isaan mana jiran 'they are at home'
they home be at-pl.
isaan deemu jiran 'they are going'

TAMIL

(25) aver vətil iruper 'he will be at home'
he home at
aver saapat kondu iruper 'he will be eating'
eating

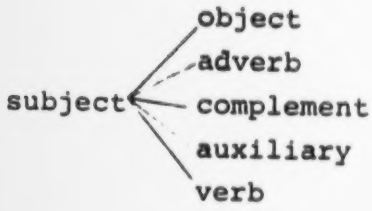
If one analyzes the auxiliary-main verb relation as that of verb (aux) to complement (main verb/noun/adjective/locative) then the discrepancy relating to auxiliary verbs are removed--the auxiliary is head to a main verb in the same way it is head to a nominal or adjectival complement.[9]

2.2.4 The final problem needs the most clarification. Why should verb and noun in (14) be assumed to contract all the bilateral relations? The answer is that they do not. In principle any two items can. However, verb and noun are distinguished from the other items by the stipulation that the head be in a relation with all other items. In some cases an item is excluded from headship for fairly obvious reasons. If, for example, the object contracted relations with all the other elements, and was thereby considered head of the clause, in the case of intransitive verbs

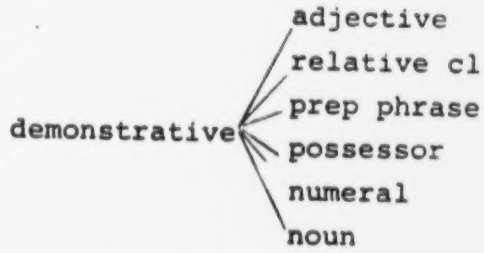
there would be no head. Similarly, in the noun phrase, if numerals were head, then uncountable nouns would occur with no head. Note that numerals and objects are excluded here on different grounds than optionality (1.2). An object is not optional for an intransitive verb, nor is a numeral for an uncountable noun, since in no instances do objects or numerals occur with these items.

Object and numerals are excluded from headship status (for purposes of sequence) by the stipulation that the head must be in a relation with all the other items, and they do not occur with some of the items. Still, there are at least two other items which are not immediately excluded on this basis, the subject of the sentence, and the demonstrative in the NP.

(26a)



(26b)



Treating the subject in this way is implausible. Recall the definition of dependency I use says that items in a dependency relation are bilaterally related to each other. However, there is no bilateral relation between he and quickly in he ran quickly, as can be seen by comparing it with he stayed quickly* Clearly verb and adverb must be in a relation here, but not subject and adverb (though examples like this do not mean that the verb is the head, only that the verb and adverb are in a relation).

For the demonstrative arguments to exclude the analysis of (26b) are less obvious. The demonstrative co-occurs without a noun with all the complements in the right-hand column of (26b) except the adjective. It also frequently agrees with other elements like a noun does (both those/that men/man).

Against this in English one does have

(27) those men's cars

but those's cars* (cf. men's cars)

which shows that the demonstrative-noun relation is more restricted than noun-noun (pssr-pssd). A similar example could be cited for Oromo, and perhaps other languages as well.

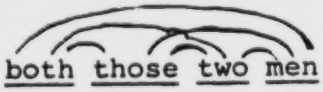
3. In this paper I have shown (1) that previous criteria used for identifying head and dependent are inadequate; (2) that a grammar which defines dependency in terms of bilateral relations, without the notions 'head' and 'dependent', can explain why certain sets of items tend to form groups, and (3) that for purposes of sequence generalizations, to the extent that they are needed (1.3.3), an adequate notion of head and dependent can be arrived at based on the definition of dependency in terms of bilateral relations. Head and dependent thus become derivative concepts based on the prior identification of bilateral dependencies.

One consequence of this characterization of dependency is that it allows a great many more dependency lines in a grammar (as argued for by Mitchell, 1975) than previous definitions and practive. Where one has only head and dependent, a dependent item can (by definition, Robinson, 1970[10]) be related to only one head. This leads to a search for the head, where by some criteria one item is head to another, but by another it is its dependent (cf. discussion around examples (15, 16) for instances of this). In

(29) both those two men came

both is in a relation (plurality) with those, two, and men, and in a special relation (duality) with the numeral since it determines that the numeral two occur (both three*). Thus, perhaps both should be considered head to two, and perhaps to those and men as well, requiring plural forms in the demonstrative and noun. But in Hudson (1982) those is head to two, and in Tesnière (1959) and Robinson (1970) men would be its head.

But as seen above there is little to be gained by designating any of them as head, at least so far as this phrase goes. Headship does not explain sequence in this case (1.3.3) and all the items in the phrase here are optional (1.2). On the other hand there is agreement in plurality between all of them, which can be taken to show that all are related to each other in terms of this category and a dependency line between both and two allows one to explain the special relationship between them in terms of a dependency relation. In my definition one simply has a series of bilateral relations here.

(30) 
both those two men came

Furthermore, if one needs a head in the phrase, then it can be provided for by the definition of (17)[11].

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NOTES

1. Recently the notion of 'head' has gained greater importance within generative grammar (though given the constituency framework of generative grammar not the idea of dependency). However, 'head' is defined in a purely formal way, as the lexical category X dominated by X^n for instance (Jackendoff 1977:30). No attempt is made to explain why the categories chosen as heads should in fact be so chosen (e.g., why should noun and not determiner be head of the noun phrase; cf. 2.2.4)

2. Mangarayi is an Australian aboriginal language.

French nouns must occur with at least an article. I disregard the French suppletive demonstratives ça--ce/cet/ces. Tamil also has a different demonstrative according to whether or not it is self-standing.

For adjectives, only Quechua unequivocally allows an adjective to be the sole constituent of a noun phrase (Cole, 76), though some of the others allow an adjective without a noun in certain contexts. In Arabic, definite article + noun (al-ka'biir 'the big (one)') is a fully productive construction; East African Nubi (an Arabic Creole) allows adjective + demonstrative, ka'bir de 'the big one' (and I suspect Swahili allows this too, yule mkubwa 'that big one').

3. This is the case in English, French, Nigerian Arabic, Oromo, Swahili, Tamil, and the Creole languages cited in Owens 1980--Sranan, Sango, Haitian, Nubi, and Cameroon Pidgin (though I give examples only for Sranan there, an examination of the sources will show this to be the case).

4. In the few instances where a verb can be ellipted, it will necessarily be understood. For instance, in gapping,

I ate the main dish and she the dessert

the verb ate must be understood in the second clause.

5. This is essentially the characterization of dependency used in Owens 1977. I take the notion of 'relation' as a primitive. Evidence that items are in a relation can be shown, inter alia, by the fact that they agree in some morphological category; are in a relation of morphological governance; and that they exhibit selectional restrictions between them, and so on.

6. Thus Hudson (1980a:185) says that if there is morphological determination it is always the head which determines the morphological form of the item it is related to.

7. Abraham (1978:700 ff) has discussed functional factors relevant to the development of case forms, factors which obtain independently of the status of an item as head or dependent.

8. This equivalence is readily apparent in many languages. For Booran Oromo, for example, I have argued (1982:60) that on syntactic grounds post-positions are a sub-class of noun.

9. This analysis runs counter to X-bar analyses (Jackendoff 1977:46; Lightfoot 1979 (using a slightly different system)) where auxiliary is a specifier (modifier) rather than head. Greenberg's data (quoted in Hawkins 1982"2) however, shows auxiliary-verb order to be overwhelmingly harmonic with head-modifier (operand-operator). Thus, of 9 verb-aux languages in his data, all but one are SOV and all are postpositional (head last); of 10 aux-verb languages all are SVO and VSO and all but one are prepositional (head first).

Hawkins points out (1982:15, 24) that Lightfoot's treatment of specifier, that is, demonstrative and auxiliary, does not in general give useful word order results, since the specifiers do not consistently appear on the same side of the word

they specify (noun/main verb). Hawkins implies (17, 25) that for word order purposes the demonstrative should be treated like any other modifier and not singled out in a special category like a specifier. I would add that the word order data also shows that the main verb should be treated as a modifier to the auxiliary, which is in accord with the grammatical analysis of auxiliaries I give here.

10. Hudson (1982:4/10) allows an item to have an unlimited number of heads, though in practice the only multiply-head constructions for him involve 'movement'--raising, relativization, and comparatives. Demonstratives and numerals have only one head and take one dependent.

11. The question of how, in dependency terms, the verb is related to subject in the present framework is beyond the scope of this paper.

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